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ABSTRACT

The principles of behavior analysis and basic behavioral definitions were utilized by clinical pharmacy students within an interdisciplinary setting to recognize and reinforce the spontaneously occurring on-task desirable behaviors of an 8-year-old hyperactive, attention deficit disordered child. Data gathered by pharmacy students from a case study under the supervision of their preceptors, a clinical pharmacist and a special educator, facilitated the physician's decision to reduce the medication for the child as behavioral intervention was implemented at home and school. Findings indicated that while the subject was taking psychostimulant medication, often recommended for children with hyperactive behaviors, the drug alone did not necessarily result in improvement of on-task, school-adaptive behaviors. Results indicated a significant increase of the subject's on-task time for the scores of five classroom behaviors--coloring, letter production, spelling, reading, and listening comprehension--following pharmacy student behavioral intervention. (Author/CL)

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INTERACTIVE PHARMACOLOGICAL AND BEHAVIORAL MANAGEMENT OF A HYPERACTIVE ATTENTION DEFICIT DISORDERED CHILD IN AN ELECTIVE PHARMACY CLERKSHIP

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ABSTRACT

This study focuses on Pharmacy students' participation in an elective pharmacy clerkship, which emphasizes working directly with patients with learning disabilities and/or children producing hyperactive behaviors. Pharmacy students participated in direct child and parent drug and behavioral evaluations and team consultations.

The principles of behavior and basic behavioral definitions were utilized by clinical pharmacy students within an interdisciplinary setting to recognize and reinforce the spontaneously occurring on-task desirable behaviors of a select, hyperactive, Attention-Deficit-Disordered child.

Data gathered by pharmacy students from a case study under the supervision of their preceptors, a clinical pharmacist and a special educator facilitated the physician's decision to reduce the medication for the subject as behavioral intervention was implemented at home and school.

The study indicated that while the eight year old female subject was taking psychostimulant medication (Cylert, 37.5 mg. 1 tablet 2X per day), often recommended for children with hyperactive behaviors, the drug alone did not necessarily result in improvement of on-task, school-adaptive behaviors.

Results indicate a significant increase of the subject's on-task time [where $t = 3.26$, $p<.05$, or better for a comparison of baseline on-task times and behavioral intervention (FR-1) on task times] for the scores of five classroom behaviors--coloring, letter production, spelling, reading, and listening comprehension--following pharmacy student behavioral intervention.

Manipulation of the external environment of the child with select hyperactive behaviors will ensure safe compliance and measured progress as skilled professionals, such as clinical pharmacists, their students, and the parents of children with ADD work together with other professionals such as special educators (1) to establish baseline data, (2) to recognize and reinforce spontaneously occurring desirable behaviors, (3) to modify instructional sequences, and (4) to utilize behavioral skills that facilitate decision making, including continued, modified , or discontinued drug intervention.

INTERACTIVE PHARMACOLOGICAL AND BEHAVIORAL MANAGEMENT OF A HYPERACTIVE ATTENTION DEFICIT DISORDERED CHILD IN AN ELECTIVE PHARMACY CLERKSHIP

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Because desirable and undesirable behaviors cannot occur at the same time, it is often advantageous to recognize and strengthen the on-task behaviors occurring spontaneously within the perplexing context of children's purposeless activity referred to as hyperactivity. According to Bax (1978), "manipulation of the external environment of the hyperactive child, rather than changing the internal environment pharmacologically, is in the long run the most likely to be helpful." [1] While calling into question the widespread use of psychostimulants to manage hyperactivity in children, this new controversial sense of direction from developmental medicine also emphasizes the need for understanding and utilizing skills that will allow health team practioners, such as clinical pharmacists and their students, to monitor behaviors as well as medications. Silver (1975) anticipated this need by stating that psychostimulants do not cure hyperactivity; however, as indicated by Piepho et al. (1977); they may make a child more available to learning. [2,3] Figure 1 represents the changes which have evolved over the last decade or more and indicate trends in managing children with select, situationally specific, hyperactive behaviors referred to as Attention Deficit Disorder (ADD) vis-a-vis managing hyperactivity and treating minimal brain dysfunction in general.

Managing Hyperactivity	Managing Select Hyperactive Behaviors
• 1937-1973	• 1973-Present
• MBD	• ADDH
• Neurological	• Behavioral
• Single Cause	• Behavioral Clusters
• Single Medical Specialist	• Patient Oriented Health Care Team: Primary Care Physician, Clinical Pharmacist, Special Educator, Parent
• Chemical Change	• Strengthen On-Task Behaviors/Patient Compliance
• Clinic/Laboratory Setting	• Classroom/Home Setting
• Group Research Design	• Single Subject Design
• Establish Implications for Hyperactive Children	• Baseline for Individual Child

Figure 1. Comparison of trends in managing hyperactive behavior in school age children.

Manipulation of the external environment of the child with select hyperactive behaviors will ensure safe compliance and measured progress as skilled professionals, such as clinical pharmacists, their students, and the parents of children with ADD work together with other professionals such as special educators (1) to establish baseline data, (2) to recognize and reinforce spontaneously occurring desirable behaviors, (3) to modify instructional sequences, and (4) to utilize behavioral skills that facilitate decision making, including continued, modified, or discontinued drug intervention.

During the mid-seventies adjunctive forms of treatment for learning and behavior problems, such as applied behavioral analysis and use of the principles of behavior, became increasingly acceptable for co-managing select hyperactive behaviors which, according to Hill et al. (1978), helped to re-establish skilled people, not pills, as problem solvers.[4]

This study focuses on pharmacy students' participation in an elective pharmacy clerkship that emphasizes working directly with patients who have learning disabilities and/or ADD children who are producing hyperactive behaviors. Pharmacy students participate in direct child and parent drug behavioral evaluations and team consultations.

Data gathered by pharmacy students from a case study under the supervision of their preceptors, a clinical pharmacist and a special educator, facilitated the physician's decision to reduce and then discontinue the medication for the subject as behavioral intervention was implemented at home and school.

The study indicated that while the eight-year-old female subject was taking psychostimulant medication upon referral, prior to and during pharmacy student behavioral intervention, the drugs alone did not necessarily result in improvement of on-task adaptive behaviors.

Description of child

Age of testing. Eight years.

Appearance. Attractive, dark hair, white female.

Reason for referral. Hyperactivity with a two - or three-second attention span, easily distracted, cannot sit still, and does not listen.

Medications. Cylert, 37.5 mg. 1 tablet 2X per day for one year with minimal improvement. Subject was on the aforementioned dosage throughout baseline and behavioral intervention sessions.

Education. Second grade with resource-room support. Previous screening indicated average cognitive potential; however, the procedures of this study were based on the subject's significantly delimited observable school adaptive behaviors.

Height. Within normal limits for age.

Weight. Within normal limits for age.

Tentative diagnostic category. From DSM III, Axis 1: 314.01; Attention Deficit Disorder with Hyperactivity (inattention, impulsivity, and hyperactivity; on-set before age 7; duration of 6 months). [5]

In this case study, the principles of behavior and basic behavioral definitions were utilized by clinical pharmacy students within an interdisciplinary setting to recognize and reinforce the spontaneously occurring on-task desirable behaviors of a hyperactive Attention Deficit Disordered Child. [6]

Behavior terminology defined by Madsen and Madsen (1974) represents contemporary usage and agreement. [7] The following examples of behavioral terminology were utilized throughout the case study and are part of the current course content of an elective pharmacy clerkship co-sponsored by the Meyer Children's

Rehabilitation Institute and the College of Pharmacy, both of the University of Nebraska Medical Center, Omaha, Nebraska. [8,9] The definitions utilized by pharmacy students for this clerkship and the case study are as follows:

Definition of terms

Baseline. A stable, usually recoverable, performance (five or more observations) upon which the effects of experimental variables can be assessed.

Behavior. Any act of an organism, either internal or external, that can be observed and/or measured.

Behavior modification/teaching. Changing behavior.

Hyperactivity. Purposeless movement and/or activity.

Incompatible alternative. Any two or more behaviors which, by the very nature of one, cannot exist with the other.

Positive reinforcement. A stimulus that, when presented as a consequence of a response, results in an increase or maintenance of that response.

Primary reinforcers. Are food, water, sleep; basic organic needs. Primary reinforcers are necessary for life and we do not manipulate these because of our ethics and values.

Secondary reinforcers. Are learned reinforcers such as tangibles: money, points, free time, or social reinforcers and praise.

Schedules of reinforcement. A schedule in which reinforcement is made contingent upon the emission of a number of responses, before one response is reinforced. With the fixed-ratio (FR)

schedule, a specific number of responses must occur prior to the reinforced response. There is also a variable-ratio (VR) schedule, a fixed-interval (FI) schedule, a variable-interval (VI), and a mixed variable schedule of reinforcement.

Case study

Baseline on-task times and behavioral intervention (FR-1) on-task times for five observable behaviors--coloring, letter production, spelling, reading, and listening comprehension--were collected by pharmacy clerkship students during two days of diagnostic evaluation. These activities were chosen because they represented an approximation of school activities typically presented to the subject on a daily basis. All baseline trials were documented in one sitting followed immediately by the behavioral intervention phase.

Table 1, "Scores of Hyperactive Child's Baseline and Behavioral Intervention (FR-1) On-Task Ti represents mean scores of five trials for each of the diagnostic evaluation behaviors.

Table 1. Scores of Hyperactive Child's Baseline and Behavioral Intervention (FR-1) On-Task Time

DIAGNOSTIC EVALUATION	BASELINE		BEHAVIORAL INTERVENTION (FR-1)		TOTAL TIME ON-TASK
● Coloring	3:42	+	7:58	=	11:40
△ Letter Production	1:42	+	3:04	=	4:46
■ Spelling	1:48	+	8:59	=	10:47
○ Reading	1:23	+	8:39	=	10:02
▲ Listening Comprehension	1:40	+	3:05	=	4:45

A fixed-ratio of one (FR-1) was chosen as a schedule of reinforcement because the subject was producing so few observable on-task

behaviors it became necessary to capitalize on those that were occurring.

Figure 2 represents a sample event recording of subject/pharmacy student's interaction and application of social reinforcers and praise and cues. Figures 2a and 2b represent examples of permanent product recordings. Verbal interactions were recorded on a tape recorder and verification of times for both baseline and behavioral intervention were made by two Pharm. D. Students and their preceptor in attendance during all of the testing sessions.

DIAGNOSTIC EVALUATION ACTIVITY	SUBJECT ON-TASK OBSERVABLE BEHAVIORS	PHARMACY STUDENT'S SECONDARY REINFORCERS ADMINISTERED (FR-1) IN RESPONSE TO SUBJECTS ON-TASK BEHAVIORS
Δ Letter Production	Subject: Selected and asked to use a "thick" primary pencil.	Pharmacy Student: "Neat Choice."
	Subject: Asked how to use the lined primary paper.	Pharmacy Student: "Your letters should touch the top and bottom lines."
	Subject: Held paper still with her left hand.	Pharmacy Student: Touched subject's left hand saying, "Holding the paper sure keeps it still."
	Subject: Produced an upper case manuscript D that touched the top and bottom lines.	Pharmacy Student: "I like the way your 'D' touches the top and bottom lines."

Figure 2. Subject/Pharmacy Student on Task Interaction.

Rather than utilizing inter-rater reliability per se in observations for baseline and behavioral intervention, on-task times were chosen which did not require examiner or observer judgments, but rather straightforward observations of whether the subject was producing the diagnostic evaluation activities, or not. It has been recommended by Romanczyk et al. (1973), in view of the difficulties associated with observational recordings, to abandon as much as possible measurements of behaviors requiring a judgment. [10]

A quasi-experimental A-B strategy was utilized, as this case study represents school skills and school behavioral assessment and not research design per se. Further, baseline A and behavioral intervention B were employed as follow-up in the subjects' school which as Hersen and Barlow (1981) conclude, approximates the more desirable and comprehensive A-B-A-B experimental design. [11] During the subject's return to her home school, reversal was observed informally by the resource teacher and anecdotically reported to the pharmacy students during the second baseline A phase. This information suggested that the experimental increase of on-task time could be attributed to the behavioral intervention (FR-I). The social reinforcers and praise and cues found in Figure 2 established by pharmacy students were then utilized by the subject's resource room teacher and regular classroom teachers to re-implement the aforementioned B, or behavioral intervention strategies.

On all baseline trials for this study, the subject was

either coloring or not coloring, producing letters or not producing letters, spelling words or not spelling words, reading or not reading, and sitting quietly for listening comprehension or not sitting quietly. Figures 2a and 2b, which were not measured directly, do however, represent changes in letter production from baseline to behavioral intervention which could be interpreted as being of better quality; however, this was a positive side

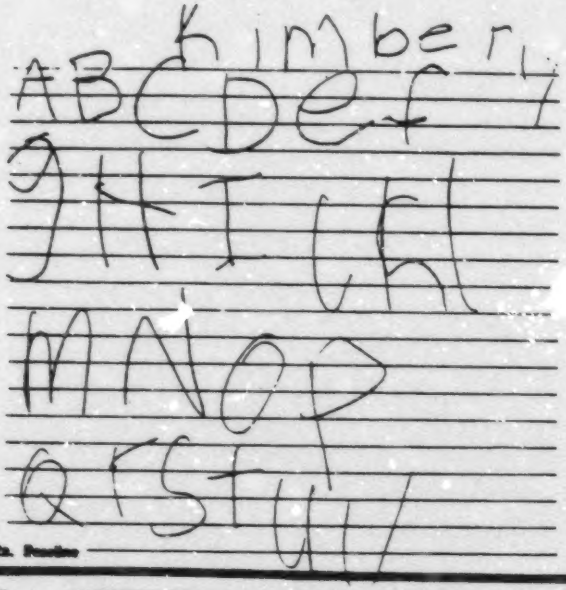


Figure 2a. Baseline

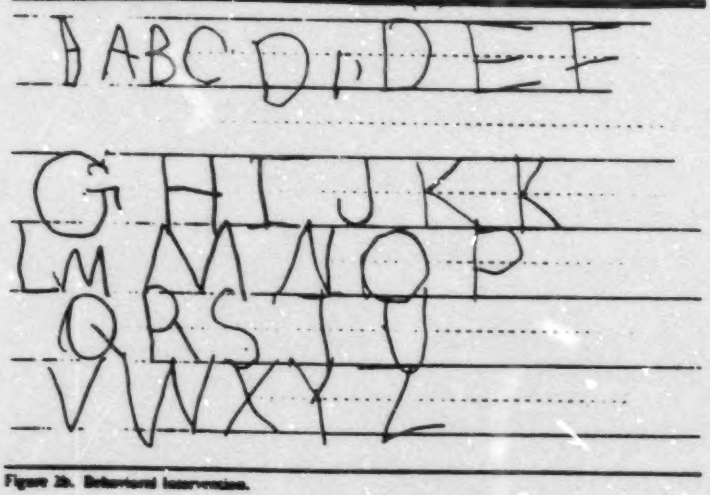


Figure 2b. Behavioral intervention.

effect of spending more time on-task, cueing, and behavioral intervention, and was neither measured directly nor used for a judgment of whether the subject was on-task during both baseline and behavioral intervention phases.

Like many children with select hyperactive behaviors, the subject in this study, when finished with a task, without reinforcement during the baseline phases, would literally "bolt" from her chair, putting the pencil down, or stop reading, for example, and leave the table and chair. Because these observations do not require a judgment call, the times recorded by the pharmacy students and their preceptors during baseline and behavioral intervention tasks, could be considered exact, except for hundredths of a second. In all cases, when there were differences in recorded times, the scores were averaged for consistency. While hyperactive and having a short attention span, the subject was reinforced by her own successes on the diagnostic evaluation activities presented. For example, at one point the subject clapped her hands for herself after spelling new and difficult words correctly. The pharmacy student commented; "I'm happy for you," which represents for many persons perhaps the strongest of reinforcers, social reinforcers, and praise.

It should be noted that social reinforcers and praise also instruct, such as on Figure 2, letter production, where the Pharmacy student commented, "I like the way your D touches the top and bottom lines." While simple in appearance, it is difficult to master the language of social reinforcers and praise and

the precursor skills of being available to a child so that the spontaneously produced on-task behaviors can be recognized as such and reinforced. It is essential that the social reinforcers and praise utilize a subject's specific behaviors that please. For example, when the subject commented on the clown face she was coloring by saying, "He is going to have funny eyes," the pharmacy student reinforced this on-task verbal behavior by commenting, " I bet he will have funny eyes," rather than using judgmental language which, while sounding positive may not be reinforcing, such as "good girl" or "nice job."

Because two behaviors cannot occur at the same time, it is often preferable to recognize and reinforce on-task desirable behaviors occurring spontaneously during activities without having to first decrease inappppropriate behaviors. This decision making process is referred to as incompatible alternatives. For example, during the behavioral intervention phase, before the subject spontaneously produced on-task coloring behaviors which were recognized and reinforced by the pharmacy student, her scribbling behaviors were ignored.

As the subject spent more time coloring the clown's eyes and outlining the circles in the clown's hat, and these behaviors were reinforced and strengthened, her scribbling activity automatically decreased without specific pharmacy student attention.

RESULTS

The t-test for small samples and small correlated means as suggested by Downie and Heath (1970), was utilized to test

for significance between baseline and behavioral intervention on-task times. [12] . Formulas were utilized for measurement of central tendency, measurement of variation, and the test of significance to further examine the efficatious use of this technique for clinical work and to re-establish the importance of measuring for significant statistical as well as "clinical" difference for pharmacy students participating in the elective clerkship on Attention Deficit Disorders. Table 2 indicates that the t - test comparison of baseline and behavioral intervention (FR-I) on-task time were significant at the .05 level of confidence where t=3.26.

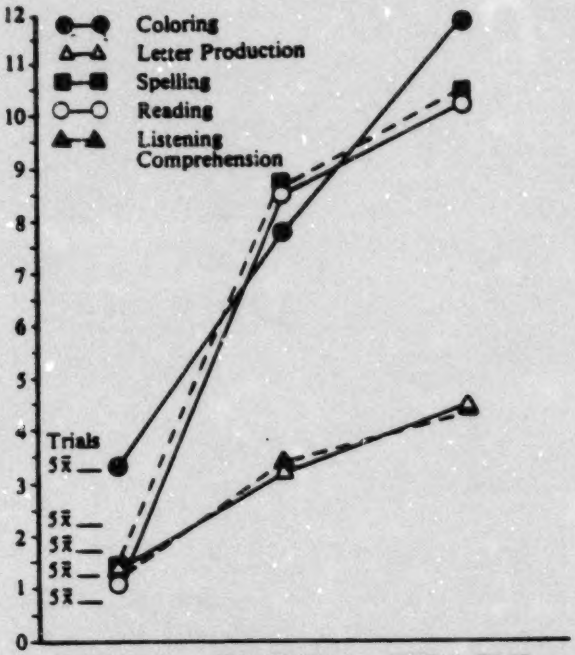
Table 2. t Test Comparison of Baseline and Behavioral Intervention (FR-I) On-Task Time

SOURCE OF DATA	N	SS	MS	d_f	t
Baseline	5	3.34	19.36	(5-1)	3.26*
Behavioral Intervention (FR-I)		32.28	220.16		

*$p < .05$ or better.

Figure 3 indicates that the significant gains and the behavior changes which most likely accounted for the statistical significance were the differences between coloring, spelling, and reading baseline and behavioral intervention on-task times.

Total time on task indicated on Figure 3 suggests that the subject's measured ability to stay on task increased on the average for all activities from 2 minutes and 3 seconds across the five baseline activities to 6 minutes and 29 seconds when behavioral intervention was utilized. Total on-task time increased to an average of 8 minutes and 40 seconds for all five activities



BASELINE		BEHAVIORAL INTERVENTION (FR-1)		TOTAL TIME ON-TASK	
Σ	$\bar{X}$	Σ	$\bar{X}$	Σ	$\bar{X}$
10:15	2.03 2 minutes 3 seconds	31:45	6.29 6 minutes 29 seconds	42:00	8:40 8 minutes 40 seconds

Figure 3. Sum and mean scores for baseline, intervention and total on-task time.

where baseline and behavioral intervention were combined. This also resulted in a more school-adaptive total on-task time of 42 minutes, where all of the activities might represent modified instructional sequences which could be administered in a resource room or regular classroom setting.

CONCLUSION

The study focuses on pharmacy student participation in an elective pharmacy clerkship which emphasized working with

patients who have learning disabilities and/or children who are producing hyperactive behaviors referred to as Attention Deficit Disorders. Pharmacy students participated in direct child and parent drug and behavioral evaluations and team consultations.

The principles of behavior and basic behavioral definitions were utilized by clinical pharmacy students within an interdisciplinary setting to recognize and reinforce the spontaneously occurring on-task desirable behaviors of a select hyperactive Attention Deficit Disordered child.

Data gathered by pharmacy students from a case study under the supervision of their preceptors, a clinician pharmacist and a special educator, facilitated the physician's decision to reduce the medication for the subject as behavioral intervention was implemented at home and school. A follow-up conversation with the physician in the child's school resulted in a decision to discontinue medication.

The study indicated that while the eight-year-old female subject was taking psychostimulant medication (Cylert, 37.5 mg, 1 tablet 2X per day) often recommended for children with hyperactive behaviors, the drug alone did not necessarily result in improvement of on-task school adaptive behaviors.

Results indicate a significant increase of the subjects' on-task time where $t = 3.26$, $p<.05$, or better, for a comparison of baseline on-task times and behavioral intervention (FR-1) on-task times for the scores of five classroom behaviors--coloring,

letter production, spelling, reading, and listening comprehension--following pharmacy students' behavioral intervention.

Manipulation of the external environment of the child with select hyperactive behaviors will ensure safe compliance and measured progress as skilled professionals, such as clinical pharmacists, their students and the parents of children with ADD work together with other professionals such as special educators (1) to establish baseline data, (2) to recognize and reinforce spontaneously occurring desirable behaviors, (3) to modify instructional sequences, and (4) to utilize behavioral skills that facilitate decision making, including continued, modifed, or discontinued drug interventions.

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